

Intel **Developer** Forum Fall 2002

Advancing the Digital Universe

**Welcome to the
Intel Developer Forum Conference
Fall 2002**

Frank Spindler
Vice President
Corporate Technology Group

9/11/01

9/11/02

Modular Enterprise Infrastructure

Sean Maloney

**Executive Vice President and General Manager
Intel Communications Group**

Mike Fister

**Senior Vice President and General Manager
Enterprise Platforms Group**

September 11, 2002

Modularity Defined

mod·u·lar *adj.*

- 1.** Of, relating to, or based on a module or modulus
- 2.** Designed with standardized units or dimensions, as for easy assembly and repair or flexible arrangement and use

Enterprise Infrastructure Challenges

- ROI
- Scalability
- Complexity
- Data Management

Enterprise Infrastructure

Handheld

Intel®
Personal
Internet Client
Architecture



802.11b

Mobile PC



Banias
Platform



802.11b/a

Desktop PC



Networking

Dual Band
Wireless
Access Point



10/100
Ethernet



Gigabit
Ethernet

Gigabit/10 Gigabit
Ethernet

Servers

Web, Application
& Database



InfiniBand*



Storage



Direct Attach
and Network
Storage

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InfiniBand*



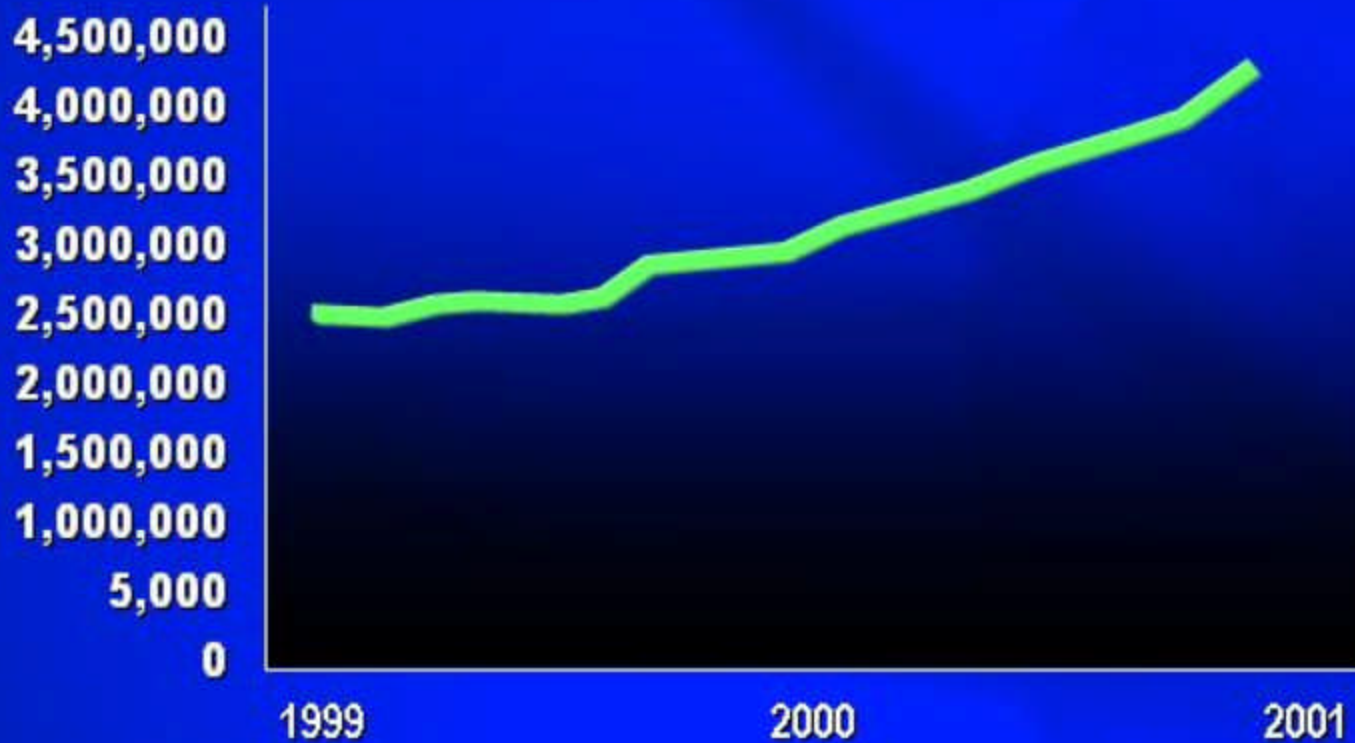
Storage



Direct Attach
and Network
Storage

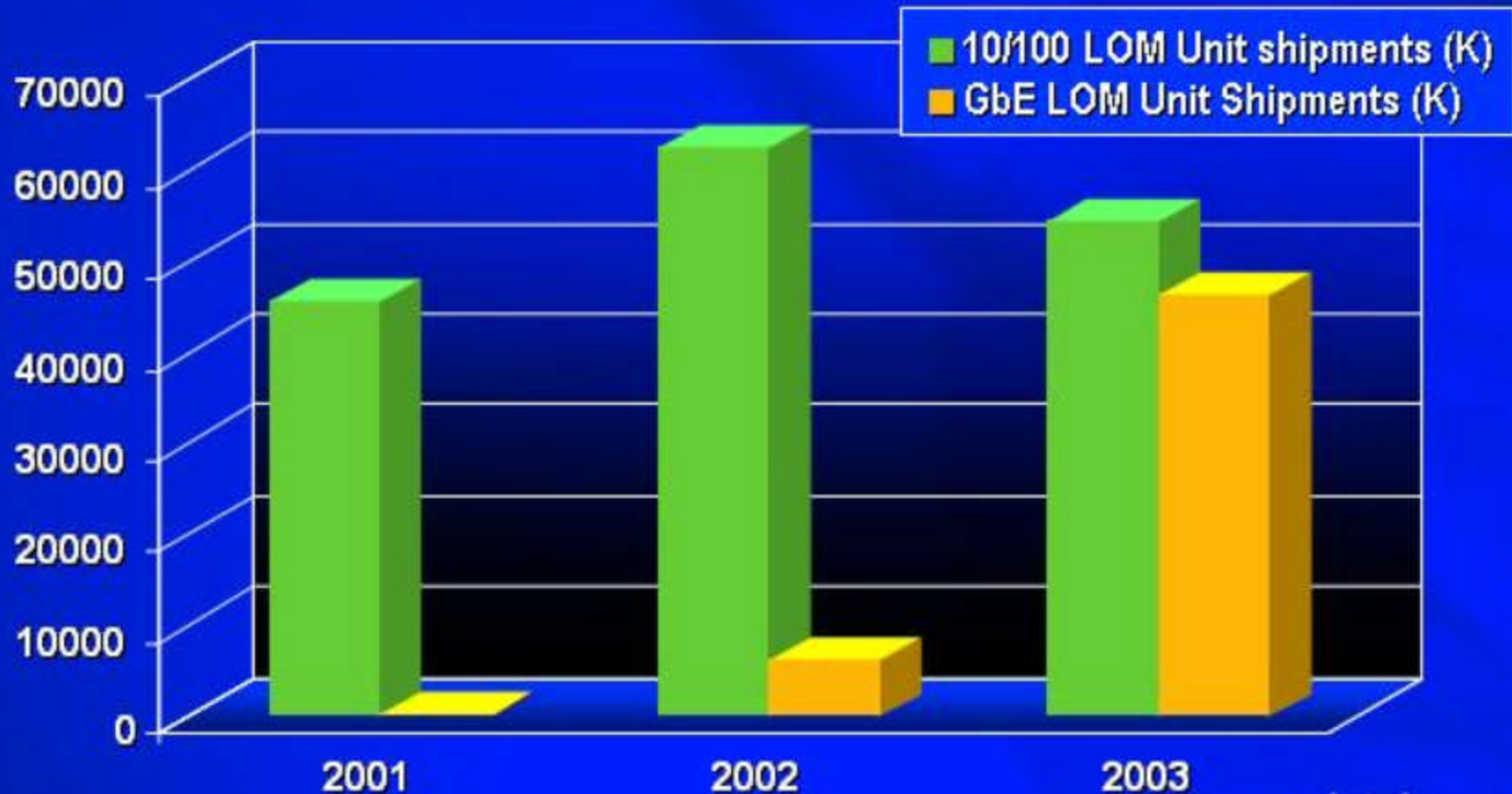
Intel Information Technology

Exchange Message Volume Per Workday



Consequence:
Continue Down the *'Ethernet Road'*

The Gigabit Ethernet Transition



Source Gartner Dataquest, July 2002

Intel Introduces the 82540EP

World's First Mobile-Optimized 32-bit GbE Controller

LOWER POWER

Lower power in deep sleep modes
for longer battery life

"Power Save" switches connection
speed when on battery power

CLKRUN# Feature suspends
PCI CLK for mobile design

LOWERED COSTS

Cheaper Motherboard Design
through Reduced Glue Logic



HIGHER PERFORMANCE

Large Send Offload /
TCP Segmentation

Interrupt Moderation

16K Jumbo frame support

SIMPLIFIED DESIGN

Reduced board space: 15mm x 15mm

Footprint Compatible
with latest 10/100 & Gigabit
connections

ENHANCED MANAGEABILITY

ASF 1.0 & SMBus 2.0 support



From Intel Developer Forum, February 2002



10 Gigabit Ethernet in Enterprise = Cost, Density

From Intel Developer Forum, February 2002

Market Segment Requirements

	 Long-Haul	 Metro	 Enterprise
Reach	100 Km +	10 – 100 Km	< 2 Km
Cost	\$\$\$\$	\$\$\$	\$\$
Power / Module	12 Watts	5 Watts	< 2 Watts
Port Density per Blade	1 port 	4 – 8 ports 	8 – 16 ports  

intel.

Introducing TXN17201/9 XPAK Multimode XAUI Transceiver

Intel first to address the needs of Data Center market segment by introducing small-form-factor multimode solution

- Small enough to fit on a PCI card
- Supports 10 Gigabit Ethernet and Fibre Channel data rates
- 1/3 less power dissipation than current solutions



TXN17201/9
XPAK
Transceiver

Why Tunable Lasers?

System Manufacturers

- Inventory & part number reduction
- Improved operations logistics
- Increased system functionality
- Improved competitive position

Carriers & Service Providers

- Inventory & part number reduction
- Sparing
- Fast restoration
- Dynamic Provisioning
- Reconfigurable OADMs
- Simplified network planning
- Improved bandwidth utilization

- I. Improve operational costs
- II. More effectively manage bandwidth

Wireless Explosion Continues

*Hot Spots May Push WLAN
Past 3G as Medium of Choice*

*Electronic Buyers News
September 1, 2002*

Wireless: Return on Investment

The Intel Case Study

INFORMATION
TECHNOLOGY
WORLDWIDE

Building the Foundation for Anytime, Anywhere Computing

How the strategic coupling of notebook computers and wireless networks makes a business more successful

By demonstrating the business case for a careful but aggressive deployment of mobile technology, IT groups add value to the overall corporation.

Wireless Invasion Deployment Challenges

- Multiple Standards (802.11b & 802.11a)
- Security Concerns

Wireless Invasion Deployment Challenges

- Multiple Standards (802.11b & 802.11a)

Dual Band 802.11 Access Points

- Security Concerns



Advanced Process Technology Announcement

Intel Unveils World's Most Advanced Chip-Making Process

HILLSBORO, Ore., August 13, 2002 — Intel Corporation today unveiled several technology breakthroughs that the company has integrated into its new 90-nanometer (nm) process...

Source: Intel Press Announcement



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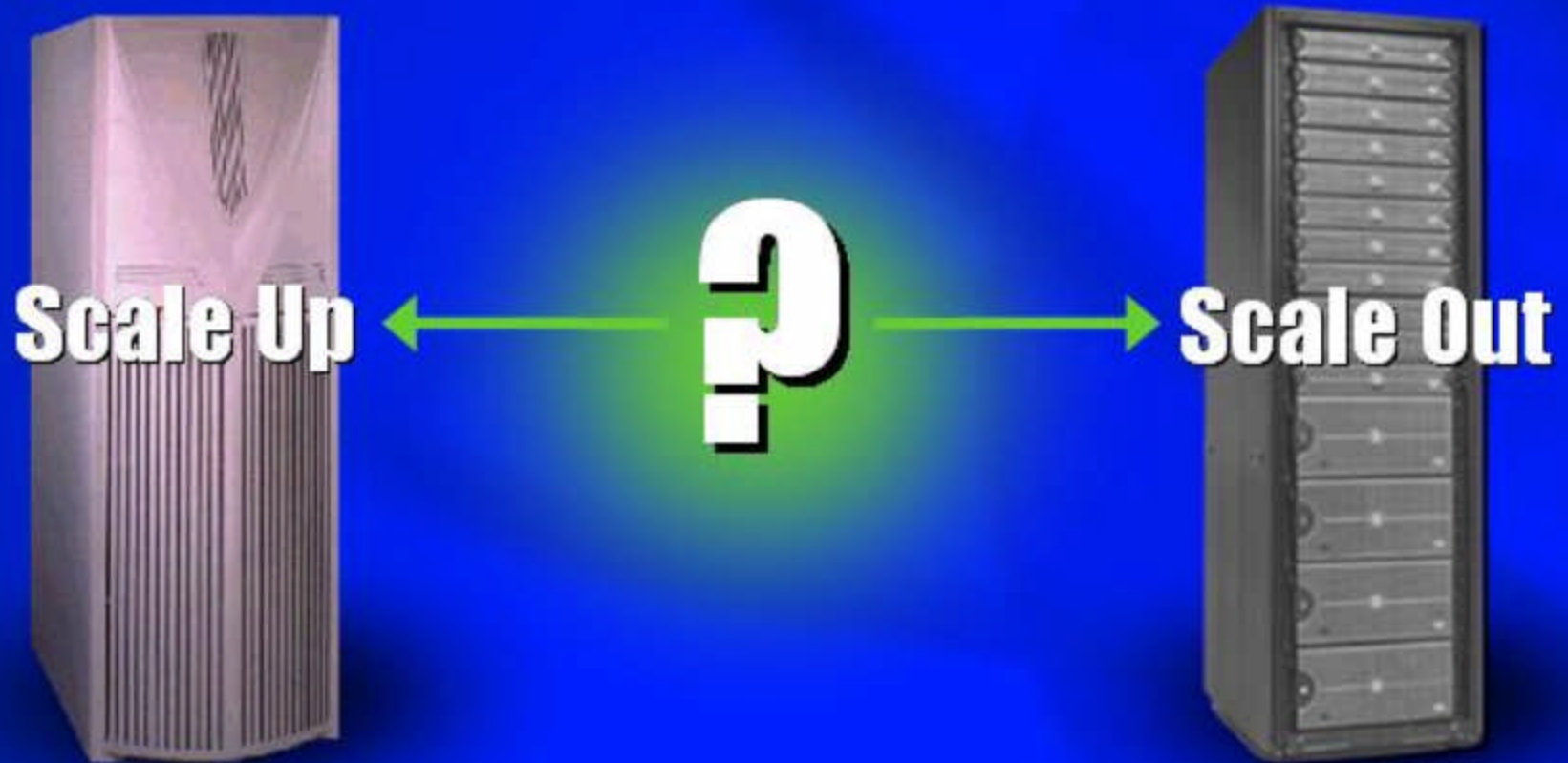


Storage



Direct Attach
and Network
Storage

Which Server Deployment Approach?



Which Server Deployment Approach?

Scale Up

Characteristics

- 4-way +
- SMP
- Shared Memory
- Partitioning



Scale Out

Which Server Deployment Approach?

Scale Up

Scale Out

Characteristics

- 4-way +
- SMP
- Shared Memory
- Partitioning



Characteristics

- 2-way to 8-way
- Clustering
- Fast interconnect
- Shared storage

Which Server Deployment Approach?

Database & Applications

- SAS Enterprise Miner*
- Microsoft SQL* server



Which Server Deployment Approach?

Database & Applications

- SAS Enterprise Miner*
- Microsoft SQL* server

Scale Up



Scale Right

Deploy 8-way and Greater Servers

Which Server Deployment Approach?

Present & Communicate

- Inktomi*
- Apache* Web Server



Which Server Deployment Approach?

Present & Communicate

- Inktomi*
- Apache* Web Server

**Scale
Right**



Scale Out



Deploy 1-way and 2-way Server Clusters

Which Server Deployment Approach?

Mid-tier Applications

- Microsoft Exchange* Server
- Oracle* 9iRAC



Which Server Deployment Approach?

Mid-tier Applications

- Microsoft Exchange* Server
- Oracle* 9iRAC

Scale Up



Scale Out

Scale Right

Scale Up with 4-way & 8-way servers,
then Scale Out with clusters

Itanium® Processor Family



MP

2002

**Itanium® 2
Processor**

2003

**Itanium® 2
Processor
(Madison)**

2004

Montecito

- **Family of processors**
- **Itanium 2 processor ramping**
- **Madison publicly demonstrated**
- **Montecito (90 nm process)**
- **Additional family members under development**



Names and dates are shown for planning purposes only and are subject to change



Itanium® 2 Processor

Record Setting Performance

BENCHMARK	SAP (2 Tier) ¹ Sales and Distribution	TPC-C ² Transaction Processing	Linpack ³ High Performance Computing
SCALE	4-way	4-way	32-way
RESULT	470 USERS	78.4K tpmC	101 GFLOPS
	WORLD RECORD	WORLD RECORD	WORLD RECORD

1 Source: benchmark 2 processor results measured on HP Server n6070 using 4 benchmark 2 processors, 10GHz with integrated 3MB L3 cache, 16GB of memory, Windows Advanced Server LC 1.2, SAP new 4.0 C, SQL Server Enterprise Edition 64bit.

2 Source: www.tpc.org/benchmark2 processor measurements done on a HP Server n6070 using 4 benchmark 2 processors, 10GHz with integrated 3MB L3 cache, 16GB memory, Windows Advanced Server LC 1.2, SQL Server Enterprise Edition 64bit, availability date 12/01/02.

3 Source: benchmark 2 processor measurements done on a HGC Server TX06510 using 32 benchmark 2 processors, 10GHz with integrated 3MB L3 cache, 128GB memory, Linux OS.

Performance, test and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by these tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, reference www.intel.com/performance/benchmark.htm or call (US) 1-800-628-6686 or 1-916-356-3104.

Itanium® 2 Processor

Record Setting Performance

New this week!

BENCHMARK	SAP (2 Tier) ¹ Sales and Distribution	TPC-C ² Transaction Processing	Linpack ³ High Performance Computing	TPC-C ⁴ Transaction Processing	Stream ⁵ Platform Bandwidth
SCALE	4-way	4-way	32-way	32-way	64-way
RESULT	470 USERS	78.4K tpmC	101 GFLOPS	308K tpmC	120 GB/sec
	WORLD RECORD	WORLD RECORD	WORLD RECORD	IA SMP RECORD	WORLD RECORD
	<small>¹ Source: benchmark 2 processor results measured on HP Server n6070 using 4 Itanium 2 processors, 10GHz with integrated 3MB L3 cache, 16GB of memory, Windows Advanced Server LC 1.2, SAP new 4.0 C, SQL Server Enterprise Edition 64bit, Availability date 12/01/02.</small>	<small>² Source: www.gisapi.org/benchmark 2 processor measurements done on a HP Server n6070 using 4 Itanium 2 processors, 10GHz with integrated 3MB L3 cache, 16GB memory, Windows Advanced Server LC 1.2, SQL Server Enterprise Edition 64bit, Availability date 12/01/02.</small>	<small>³ Source: benchmark 2 processor measurements done on a HGC Server T1016510 using 32 Itanium 2 processors, 10GHz with integrated 3MB L3 cache, 12GB memory, Linux OS.</small>	<small>⁴ Source: benchmark 2 processor measurements done on a HGC T1016510 Server using 32 Itanium 2 processors with integrated 3MB L3 cache, 12GB memory, Windows .NET Server 2003, Datacenter Edition, Microsoft SQL Server 2000 Enterprise Edition (64-bit) beta version, Availability date 12/01/02.</small>	<small>⁵ Source: benchmark 2 processor measurements done on a SQL Scalable Linux System using 64 Itanium 2 processors, 12GB memory, Linux OS.</small>

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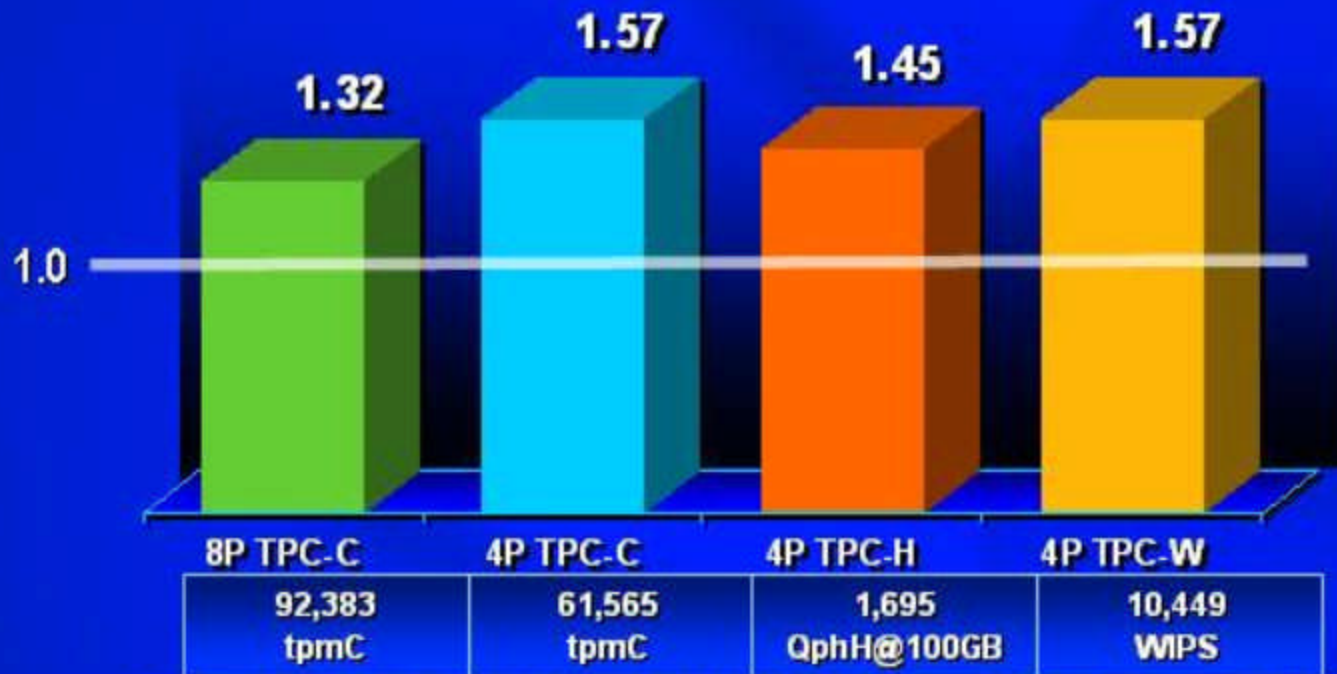
Xeon™ Processor Family

		2001	2002	2003
	MP	Pentium® III Xeon™ Processor	Xeon™ Processor MP	Xeon™ Processor MP (Gallatin)
	DP	Pentium® III Processor	Xeon™ Processor	Nocona

- Price / performance and throughput leadership
- Intel® NetBurst™ microarchitecture
- Intel® Hyper-Threading Technology
 - Now for workstations

Intel® Xeon™ Processor MP Performance

Intel® Xeon™ Processor MP 1.6 GHz with 1MB L3 Cache vs.
Pentium® III Xeon™ processor 900MHz with 2MB L2 Cache



Source: tpc.org (Sept 2002) See backup for links to system configuration details

8P TPC-C results:
Intel® Xeon™ Processor MP-based server: Reference as published:
92,383 tpmC, 7.78 \$/tpmC, available 01/01/02™. For more information,
see: <http://www.tpc.org/tpcc/subsite.cfm?subsite=detail&id=10000000>
Intel® Pentium® III Xeon™ processor-based server: Reference as
published: 69,962 tpmC, 8.40 \$/tpmC, available 11/15/01™. For more
information, see:
<http://www.tpc.org/tpcc/subsite.cfm?subsite=detail&id=10000000>

4P TPC-C results:
Intel® Xeon™ Processor MP-based server: Reference as published:
61,565 tpmC, 6.13 \$/tpmC, available 12/01/02™. For more information, see:
<http://www.tpc.org/tpcc/subsite.cfm?subsite=detail&id=10000000>
Intel® Xeon™ Processor MP-based server: Reference as published:
35,158 tpmC, 7.30 \$/tpmC, available 10/15/01™. For more information, see:
<http://www.tpc.org/tpcc/subsite.cfm?subsite=detail&id=10000000>

4P TPC-H results:
Intel® Xeon™ Processor MP-based server: Reference as published:
1,695 QphH@100GB, 82 \$/QphH @100GB, available 06/01/02™. For more
information, see:
<http://www.tpc.org/tpch/subsite.cfm?subsite=detail&id=10000000>
Intel® Pentium® III Xeon™ processor-based server: Reference as
published: 1,109.70 QphH@100GB, 136 \$/QphH @100GB, available
05/01/01™. For more information, see:
<http://www.tpc.org/tpch/subsite.cfm?subsite=detail&id=10000000>

4P TPC-W results:
Intel® Xeon™ Processor MP-based server: Reference as published:
10,449 WIPS, 27.20 \$/WIPS, available 06/01/02™. For more information, see:
<http://www.tpc.org/tpcw/subsite.cfm?subsite=detail&id=10000000>
Intel® Pentium® III Xeon™ processor-based server:
Reference as published: 6,522 WIPS, 25.70 \$/WIPS, available
12/01/01™. For more information, see:
<http://www.tpc.org/tpcw/subsite.cfm?subsite=detail&id=10000000>

Data is current as of Sept 3, 2002. Previously published TPC results data obtained from publicly available information and is subject to change without notice. Contact the manufacturer for the most recent information. TPC-C, tpmC, \$/tpmC, TPC-H, QphH, \$/QphH, TPC-W, WIPS, and \$/WIPS are trademarks of the Transaction Processing Performance Council.

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Beyond Processors



E-VIS DEMO



Great Progress...
BUT *More is Needed*

CIOs Still Want...

- **Real-time, flexible capacity**
 - Computing and storage
- **Seamless, simple manageability**
Inherent RAS
 - Reliability, availability, and serviceability
- **Efficiency and high ROI**

HW & SW Evolving to Meet Requirements

Hardware Infrastructure

Software Infrastructure

Timeshare



**Client
Server**



N-tier

HW & SW Evolving to Meet Requirements

Hardware Infrastructure

Timeshare



Client
Server



N-tier

Software Infrastructure

Monolithic App



App Server



J2EE or CLR

Web
Services

HW & SW Evolving to Meet Requirements

Hardware Infrastructure

Timeshare



Client
Server



N-tier

Software Infrastructure

Monolithic App



App Server



J2EE or CLR

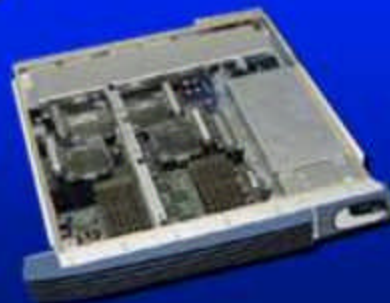
Web
Services

**Modular
Computing**

**Modular Computing is *distributed*
hardware, software, and data**

Elements of Modular Computing

Hardware



Elements of Modular Computing

Software



- Abstractions
- Clustering
- Management
- Automation
- Services

Hardware



Elements of Modular Computing

Software



- Abstractions
- Clustering
- Management
- Automation
- Services

Data



Hardware



The Modular Computing Data Center

Virtualization

- Dynamic logical partitioning
- Compute, I/O, and storage
- Devices, O.S., and apps

Automation

- Self-optimizing
- Provisioning
- Self-healing
- SW updates
- Auto failover
- Performance optimization
- Auto recovery

SOFTWARE
Manages Complexity



HARDWARE
Delivers Flexibility
And Value

Open standards & protocols

Modularity

Independent
scaling

App logic,
server, & network



Tom Bradicich, Ph.D.
Chief Technology Officer
IBM xSeries Servers

The 7 Benefits of Blade Architecture

1. *Lower Cost*
2. *Density*
3. *Cable Management*
4. *Set-up / Configurability*
5. *Reliability / Availability / Serviceability*
6. *Integrated Management*
7. *Flexible Technologies*

**"Node
Amortization"**

"RASM"

**"Server / Network
Integration"**



DEMO

IBM

Intel and Modular Computing

- Provide leadership in silicon, architecture, and solutions
- Bring IA ecosystem benefits to modular computing
 - Choice, Innovation, and Value
- Enable and deliver modular solutions

Enterprise Infrastructure

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Personal
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Mobile PC



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802.11b/a

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InfiniBand*



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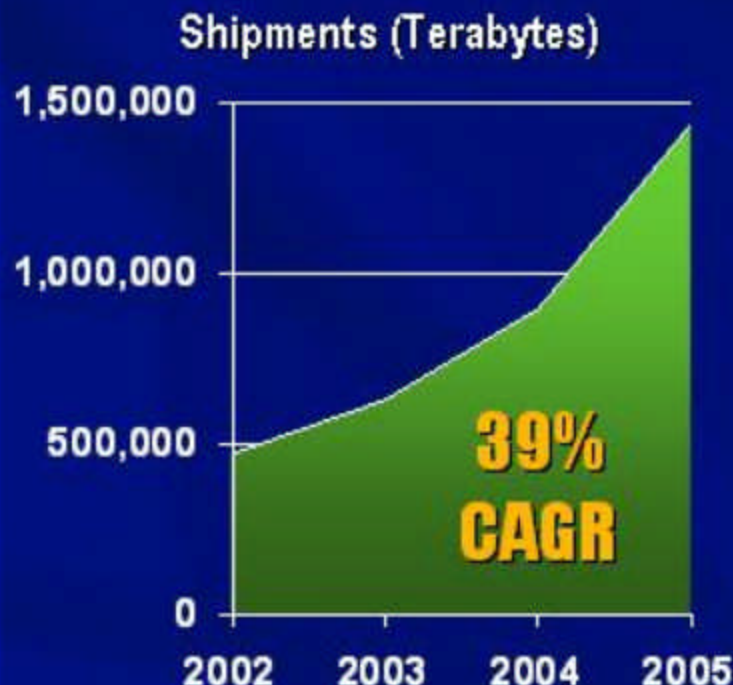


Direct Attach
and Network
Storage

Data Growth Continues

- Data requirements continue to grow at 30% - 40% CAGR
- Enterprises require 24 X 7 X 365 access to data
- More data must be managed with proportionally fewer IT dollars

WW Disk Storage Forecast



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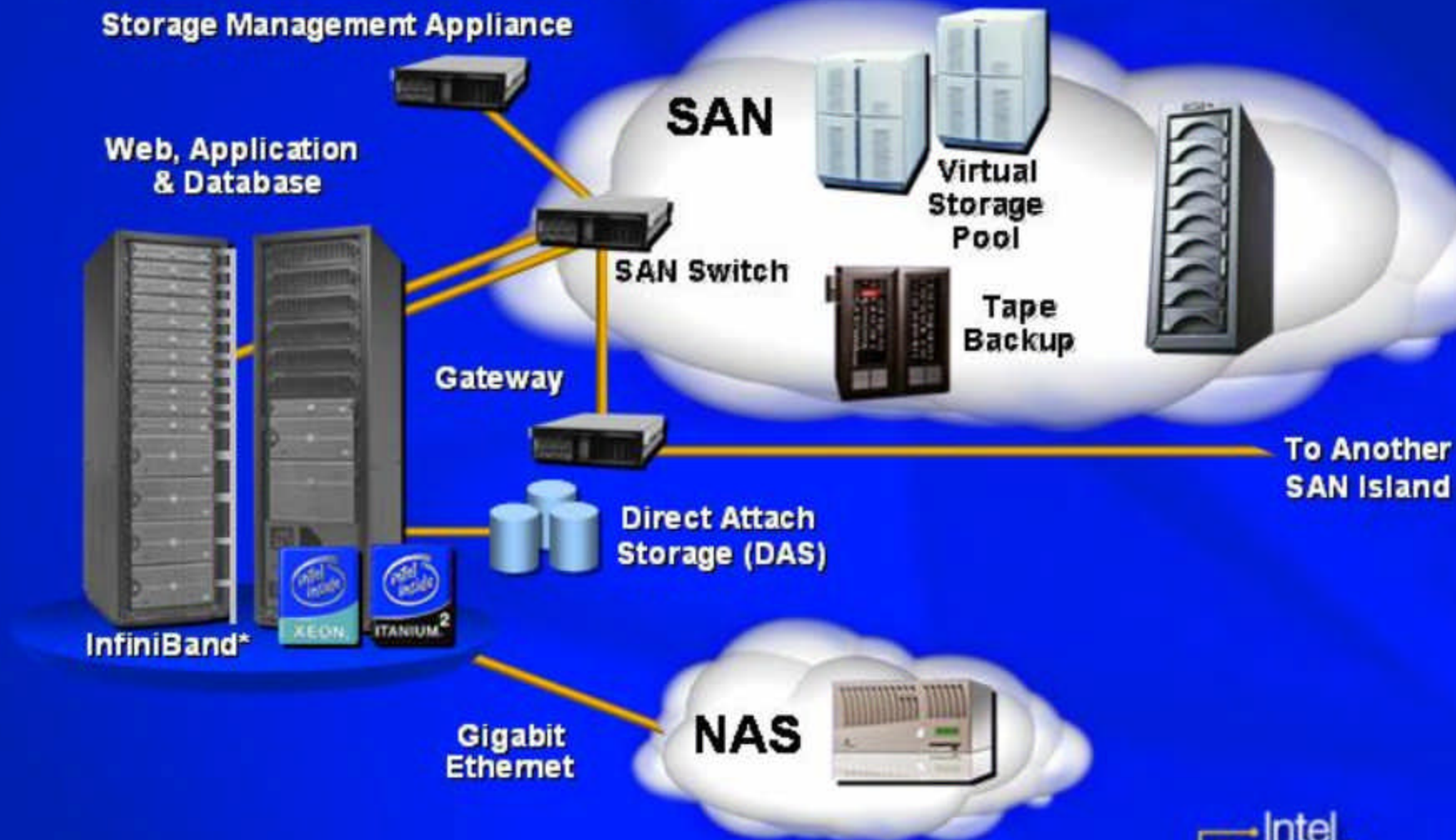


Storage

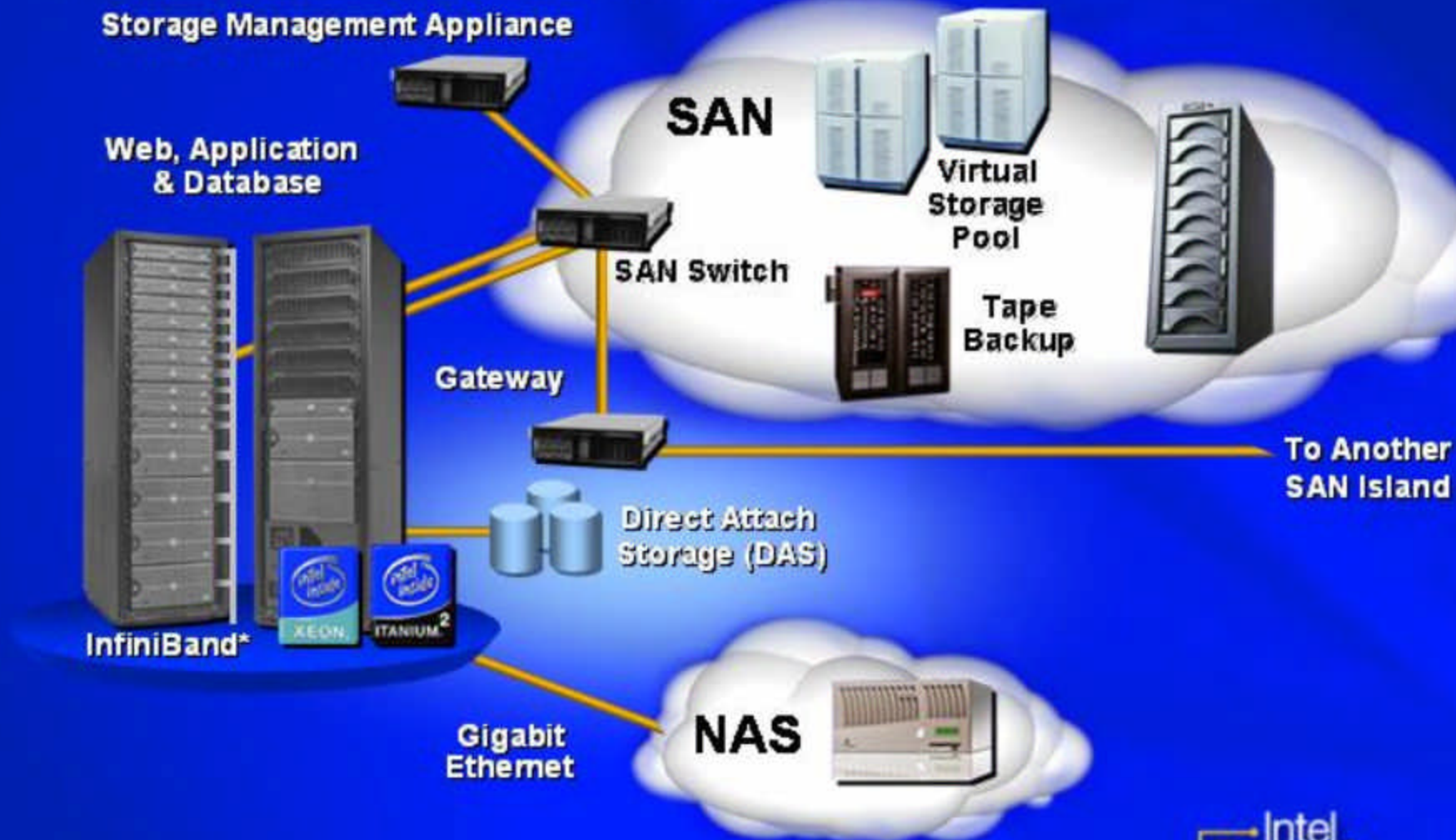


Direct Attach
and Network
Storage

Storage in the Enterprise



Storage in the Enterprise



Serial Disk Transitions are Coming!

Parallel

Serial Technologies

**PATA
SCSI**

SATA 1.0

**SATA II
Serial SCSI**

**PRE
2001**

2002

2003

2004

2005



**It's a
Serial World**

intel.

Intel
Developer
Forum
Fall 2002

Serial ATA Poised for Market Ramp

**Plugfest, Demonstrations, Specification and Product Announcements
Build Momentum for Next-Generation Storage Connection**

INTEL DEVELOPER FORUM, SAN JOSE, SEPTEMBER 11, 2002 – The Serial ATA Working Group announced today the release candidate of the first phase of the **Serial ATA II** specification.

Source: Intel Press Announcement



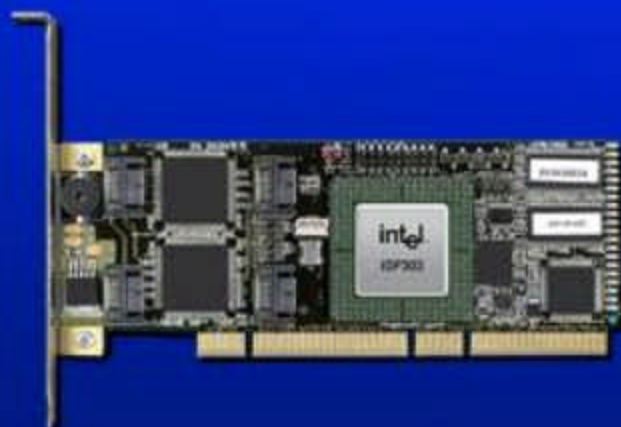
Introducing New RAID CONTROLLER Products



2 Gb FiberChannel



2 Channel U320 SCSI



4 Port Serial ATA

Intel® RAIDIOS Technology

RAIDIOS (RAID I/O Steering) Logic is an Intel developed specification that

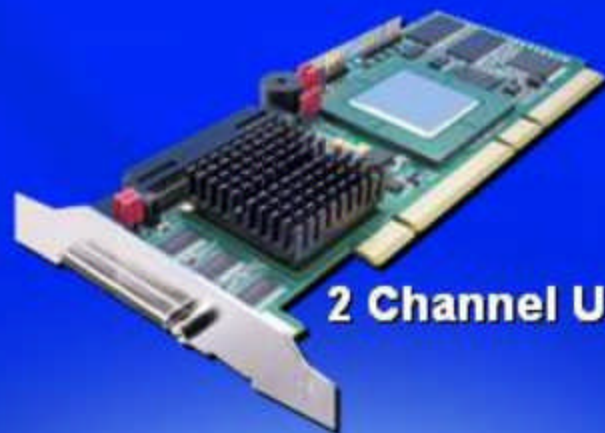
- Adds data protection to any enabled server platform
- Lowers cost vs. traditional PCI RAID cards
- Disk interconnect independent (U320, U160, SATA)

**Intel is leading the platform
integration of RAID functionality**

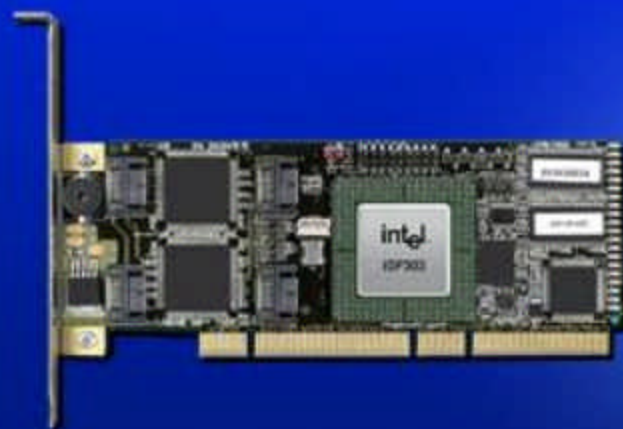
Introducing New RAID CONTROLLER Products



2 Gb FiberChannel



2 Channel U320 SCSI

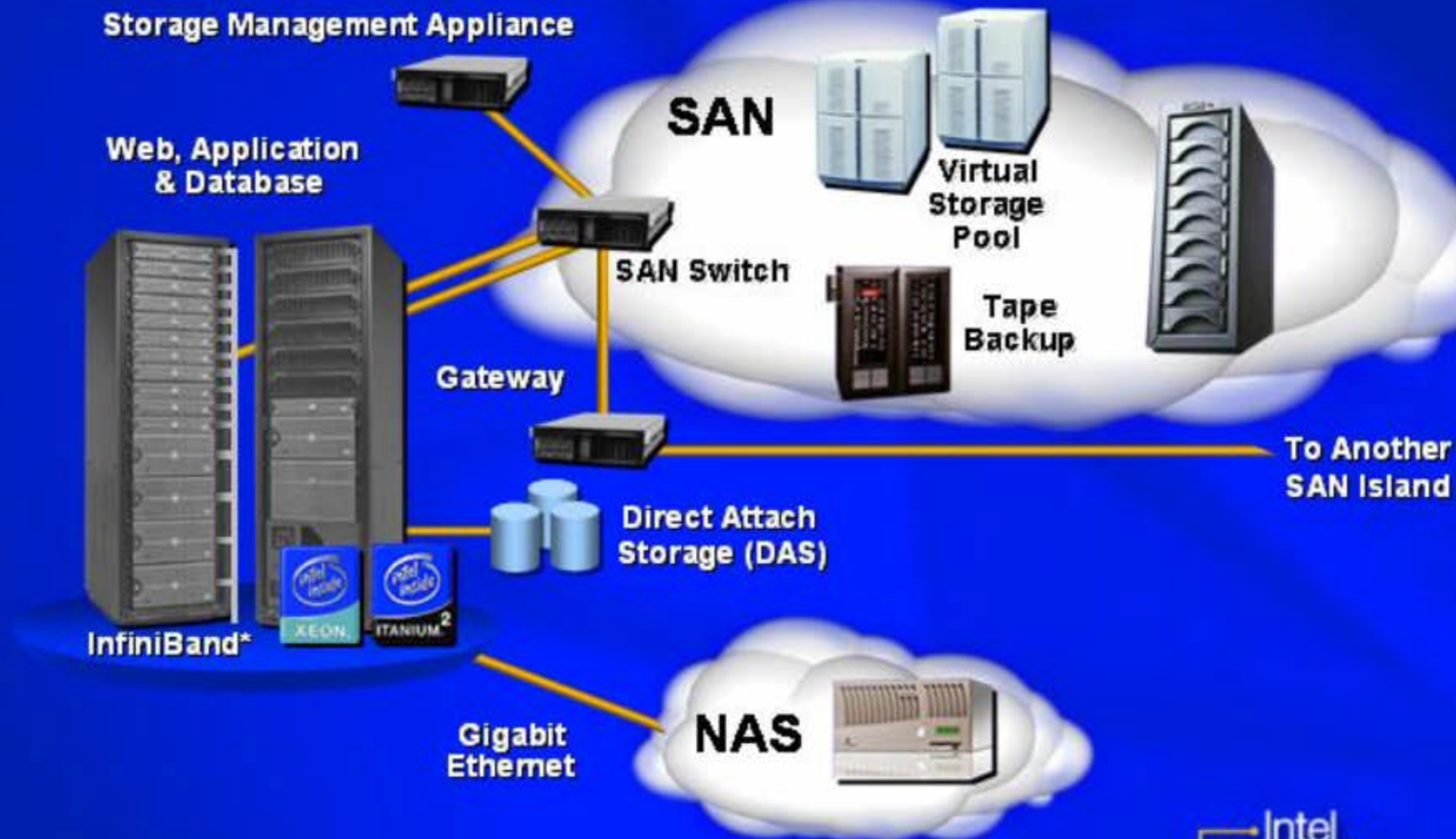


4 Port Serial ATA



**RAIDIOS-Enabled Zero
Channel RAID**

Networked Storage



Network Attached Storage and Storage Area Network Dynamics

- **Performance:**
Integer, I/O and memory performance
- **Scalability:**
Broad range of processor, I/O and thermal solutions
- **Flexibility:**
Extensive HW and SW ecosystem
- **Standardization:**
Drive and utilize industry standards to accelerate TTM

Networked Storage

EMC²

where information lives

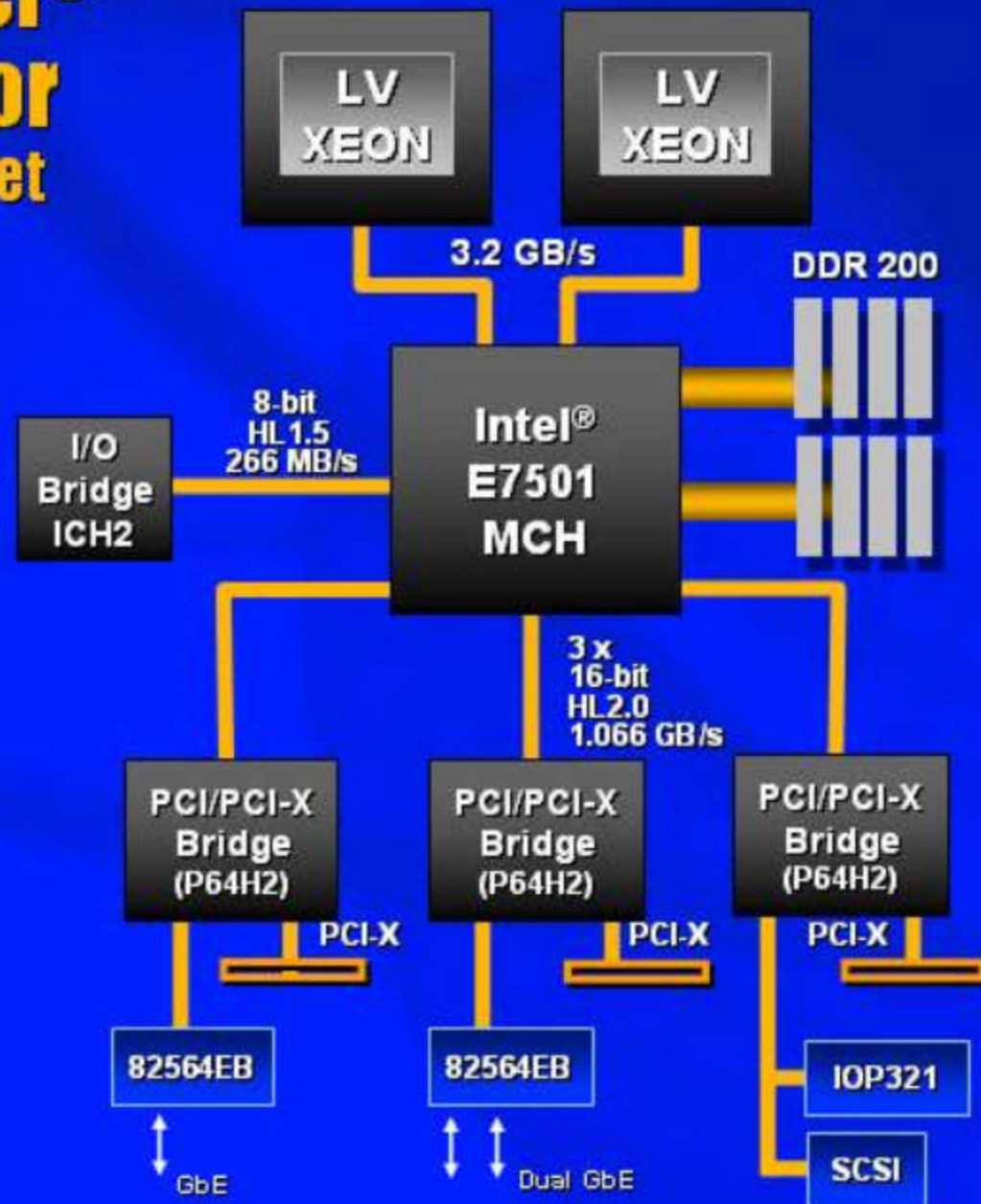
Dave Donatelli

EVP Clariion & Celerra Product Lines

VIDEO

Low Voltage Intel® Xeon™ Processor with Intel® E7500 chipset

- 1.6GHz
- FCPGA2P package
- PSB: 400 MHz
- TDP: 30w
- Voltage: 1.3V



SANSymphony* DEMO



Drew Jensen



* Other brands and names may be claimed as the property of others.

It's a Big Industry Effort!

INDUSTRY STANDARDS



BOARDS AND PLATFORMS



DRIVES AND ENCLOSURES



COMPLIMENTARY SILICON



It's a Big Industry Effort!

EMBEDDED SYSTEM MANUFACTURERS



PLATFORMS



INDUSTRY S



PCI



BIOS, RTOS, and OS



FU



APPLICATION SOFTWARE



ogies

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Servers

Web, Application
& Database



InfiniBand*



Storage



Direct Attach
and Network
Storage

Enterprise Infrastructure Challenges

- ROI
- Scalability
- Complexity
- Data Management

intel®

AlertVIEW, AnyPoint, AppChoice, BoardWatch, BunnyPeople, CablePort, Celeron, Chips, CT Media, Dialogic, DM3, EtherExpress, ETOX, FlashFile, i386, i486, i960, iCOMP, InstantIP, Intel, Intel logo, Intel386, Intel486, Intel740, IntelDX2, IntelDX4, IntelSX2, Intel Create & Share, Intel GigaBlade, Intel InBusiness, Intel Inside, Intel Inside logo, Intel NetBurst, Intel NetMerge, Intel NetStructure, Intel Play, Intel Play logo, Intel SingleDriver, Intel SpeedStep, Intel StrataFlash, Intel TeamStation, Intel Xeon, Intel XScale, IPLink, Itanium, LANDesk, LanRover, MCS, MMX, MMX logo, Optimizer logo, OverDrive, Paragon, PC Dads, PC Parents, PDCharm, Pentium, Pentium II Xeon, Pentium III Xeon, Performance at Your Command, RemoteExpress, Shiva, SmartDie, Solutions960, Sound Mark, StorageExpress, The Computer Inside., The Journey Inside, TokenExpress, Trillium, VoiceBrick, Vtune, and Xircom are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

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